MUFFIN

Multi-Scale Urban Flood Forecasting: from local tailored systems to a pan-European service

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Water JPI
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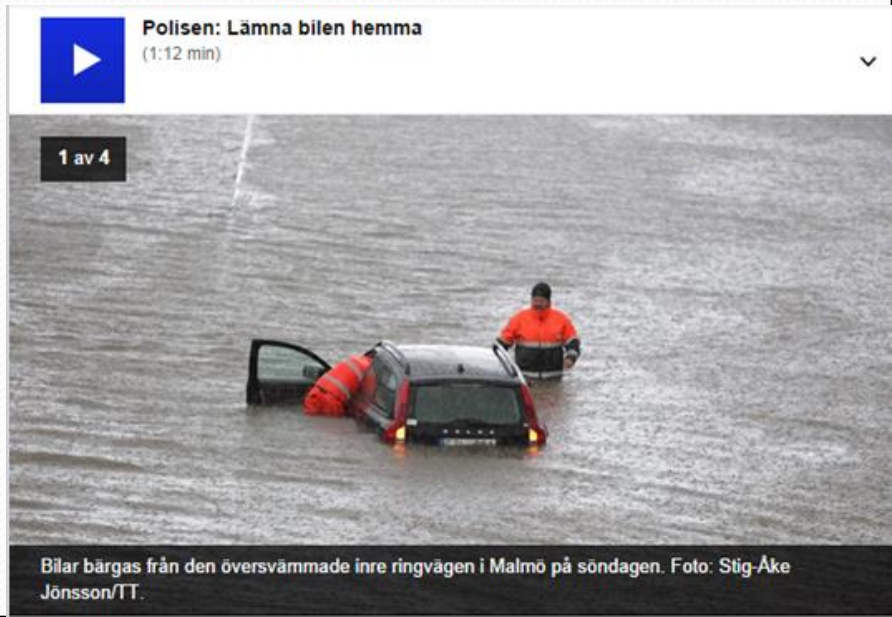
CONSORTIUM DESCRIPTION

ACRONYM	TOPIC	Coordination	Partners
MUFFIN	**2 ; 3**		  
Multi-Scale Urban Flood Forecasting: from local tailored systems to a pan-European service		**urban flooding; multi-scale forecasting; intense rainfall; end-user value; European service**	

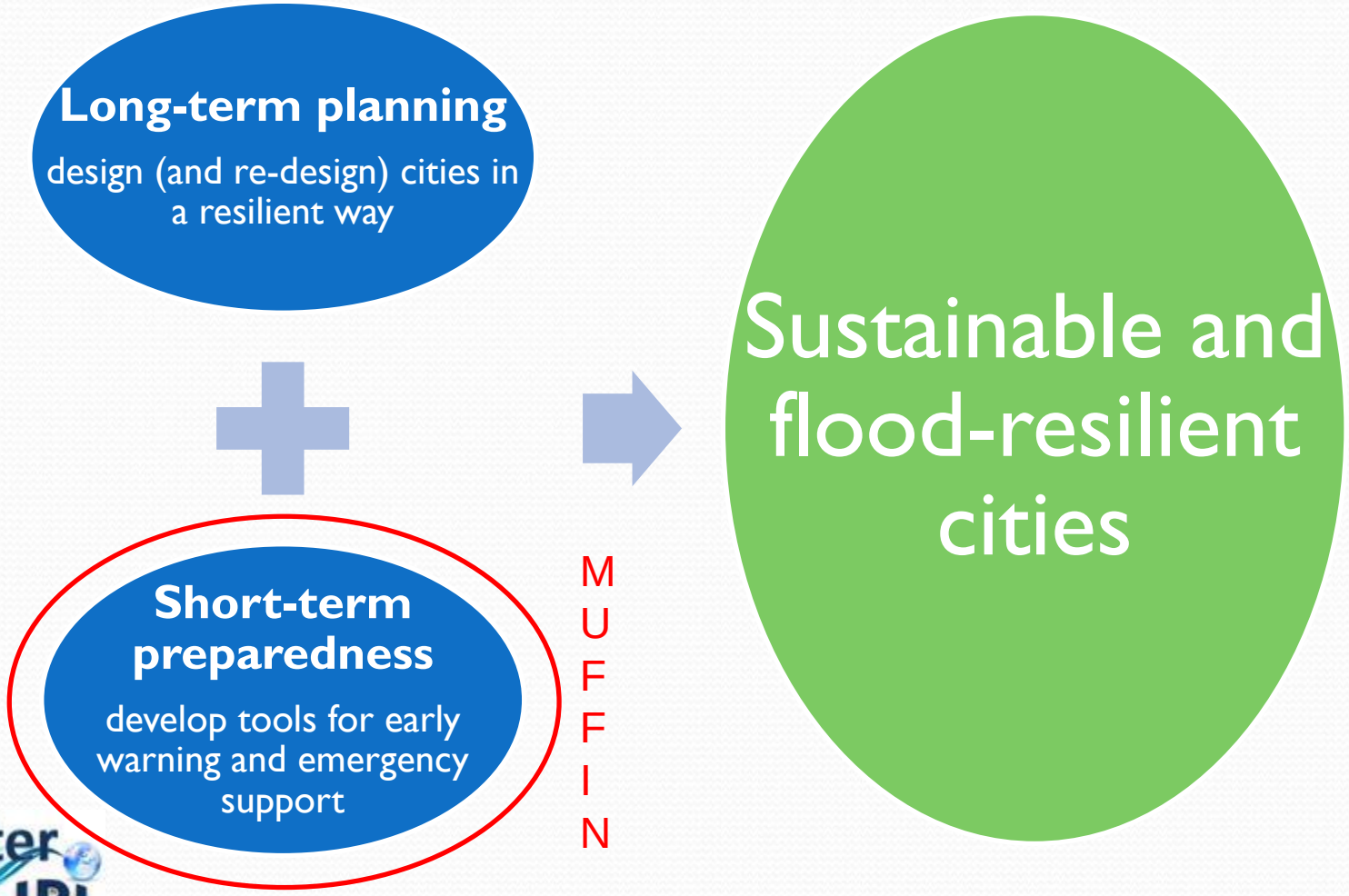
PRINCIPAL INVESTIGATOR	INSTITUTION	COUNTRY
Jonas Olsson	**Swedish Meterological and Hydrological Institute**	**Sweden**
Søren Thorndahl	Aalborg University	Denmark
Herman Russchenberg	Delft University of Technology	The Netherlands
Teemu Kokkonen	Aalto and Helsinki University	Finland

The problem

- Urban flooding is a problem already today
- Urban population is rapidly growing worldwide (2 → 4 billion in ~30 years; UN)
- This generally increases both main types of flood risk
  - *Pluvial flooding (intense rainfall)* – because of densification of central parts
  - *Fluvial flooding (river discharge)* – because of city expanding to flood-prone areas
- Further more intense rainfall is expected in a warmer climate
- **The urban flooding hazard is expected to increase**



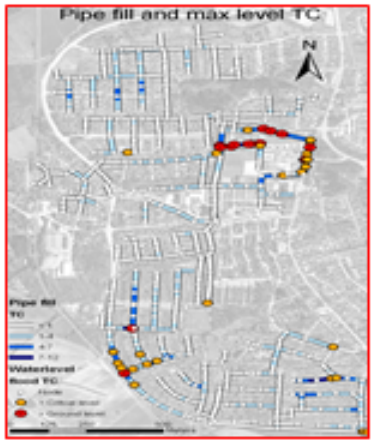
The solution



Flood models: state-of-the-art

Local hydraulic models

- Primarily designed for pluvial flooding in highly urbanized areas
- Describes coupled flows on surface and in sewers
- Temporal resolution down to seconds and spatial resolution down to metres
- Set-up and execution requires substantial resources for every area



Multi-basin hydrologic models

- Primarily designed for fluvial (i.e. river) flooding in rural areas
- Describes infiltration and river discharge
- Temporal resolution generally 1 day and spatial resolution ~ 1 km
- Can be set up and executed over large regions with limited resources

Water JPI

MUFFIN: objectives and originality

The overall objectives of the project is to

- Explore today's performance limits of both types of modelling/forecasting approaches
- Assess the value of forecast resolution and accuracy for a selection of key end-users
- Bridge the gap between the urban and large-scale hydrological modelling communities, for providing mutual benefits and an arena for new thinking

MUFFIN: relation to call

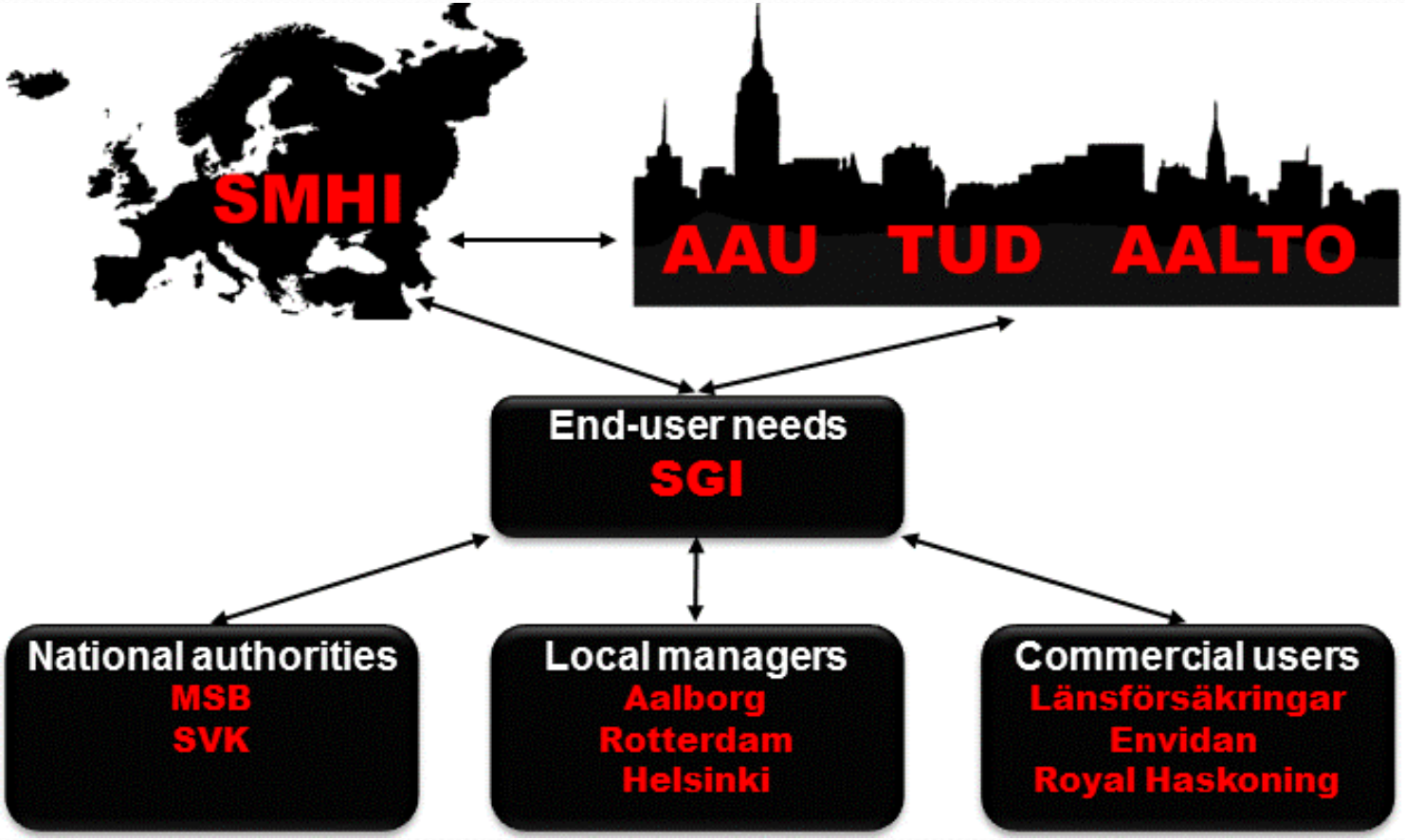
The proposal specifically addresses the third topic of the call, i.e. *Research and Innovation for Developing Technological Solutions and Services to Mitigate Impacts of Extreme Events (Floods and Droughts) at Catchment Scale*, including all three sub-topics:

- *Innovative tools for protection:* The project includes application and development of new sensors, monitoring systems and methodologies to observe and predict extreme rainfall

- *Mitigating harmful impacts:* The flood models will support analysis and evaluation of Sustainable Urban Drainage Systems (SUDS) such as green roofs, swales and infiltration systems

- *Risk management solutions:* The ultimate aim is improved tools, products and procedures for early warning of urban flooding using different systems in different environments and at different scales

MUFFIN: consortium connections



MUFFIN: work packages

WP1 MANAGEMENT

- Task 1.1 Management and coordination
- Task 1.2 Advisory Board

MUFFIN: work packages

WP2 END-USER VALUE

- Task 2.1 Inventory and requirement specification
- Task 2.2 GIS analysis and application
- Task 2.3 Meeting, reporting and post-project planning

MUFFIN: work packages

WP3 HYDRO-METEOROLOGICAL DATA

- Task 3.1 Precipitation observations
- Task 3.2 Observations of other variables
- Task 3.3 Meteorological forecasts and nowcasts
- Task 3.4 Data quality, synchronization and exchange

MUFFIN: work packages

WP4 URBAN FLOOD FORECASTING

- Task 4.1 Urban catchment characterization
- Task 4.2 Local model development
- Task 4.3 Multi-basin model development
- Task 4.4 Multi-scale experiments
- Task 4.5 Analysis and synthesis
- Task 4.6 Interpretation and presentation

MUFFIN: work packages

WP5 EXPLOITATION AND DISSEMINATION

- Task 5.1 Exploitation
- Task 5.2 Dissemination

MUFFIN: the overall picture

Table 3: List of milestones and deliverables.

Milestones (month/s):	**Deliverables (month/s):**
M1.1 AB meetings (3,18,34)	D1.1 Final report, including post-project plan (36)
M2.1 End-user workshops/meetings (3,18,34)	D2.1 End-user Requirement Specification (4)
M2.2 End-user survey completed	D2.2 GIS application (36)
M3.1 Forecasting/nowcasting methodology (12)	D2.3 End-user Report (part of final report) (36)
M4.1 Land-use data retrieved and flood models developed (10)	D3.1 Observational data for flood model development and calibration (12)
M4.2 Flood models set-up, events selected (18)	D3.2 Meteorological hindcasts for flood model simulations (18)
M4.3 Historical hindcasts performed (22)	D3.3 Report on hydro-meteorological forcing in the project (21)
M4.4 Real-time demonstration runs completed (28)	D3.4 Final observational data bases (36)
M4.5 Analysis and interpretation done (30)	D4.1 Report of flood model development in the project (16)
M5.1 Web-site constructed, updates + newsletter (3 + 9, 21, 33)	D4.2 Report of the results from the multi-scale experiments (30)
	D4.3 Material for end-user feedback (33)
	D5.1 Pre-operational systems (36)

Table 4: Gantt chart giving the overview of project activities.

			2016			2017				2018				2019
WP	**Task**	**Activity**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
1	1.1	Management and coordination											D1.1	
	1.2	Advisory board meetings	M1.1					M1.1						M1.1
2	2.1	Inventory and requirements				M2.2								
	2.2	GIS application												D2.2
	2.3	Meeting, reporting, planning	M2.1	D2.1				M2.1					D2.3	M2.1
3	3.1	Precipitation observations				D3.1								D3.4
	3.2	Other observations				D3.1								D3.4
	3.3	Forecasts and nowcasts				M3.1		D3.2						
	3.4	Data management, exchange							D3.3					
4	4.1	Catchment characterization						M4.2						
	4.2	Local model set-up				M4.1		M4.2						
	4.3	HYPE model set-up				M4.1		M4.2						
	4.4	Multi-scale experiments								M4.3		M4.4		
	4.5	Analysis and synthesis										M4.5		
	4.6	Interpretation, presentation						D4.1				D4.2	D4.3	
5	5.1	Exploitation												D5.1
	5.2	Dissemination	M5.1		M5.1				M5.1				M5.1	

MUFFIN: outcome and impacts

The main expected outputs

- Local and Pan-European urban flood forecasting systems with quantified performance/accuracy
- Data bases with high-resolution hydro-meteorological data from the case cities
- Scientific publications and scientific conference contributions
- End-user outreach: open workshops and tailored reports, as well as GIS visualization tool for end-users
- Short-term exchange of researchers and students between the consortium partners will be aimed at through coupled projects and activities